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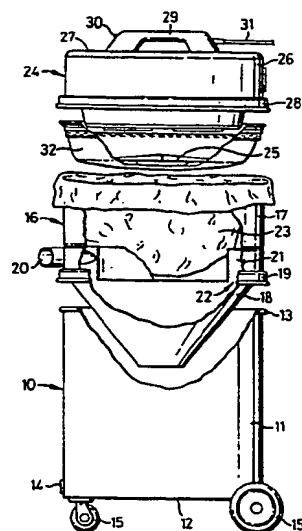
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⑤④ **Vacuum cleaners.**

⑤⑦ A vacuum cleaner comprising a container (10) for collecting dust particles and air transport means (24) for drawing air containing the dust particles into the container (10) is additionally provided with a frusto-conical cyclone separator chamber (16) for creating a cyclonic formation of the air causing heavier particles to be separated from lighter particles in the air.



**EP 0 033 250 A1**

- 2 -

This invention relates to vacuum cleaners.

It is known to provide vacuum cleaners to remove dust particles from surfaces. Such cleaners include air transport means for creating an air flow adjacent a surface which is to be cleaned of dust particles and transporting the dust particles away from the surface and a container for receiving dust particles separated from the air flow.

Although such cleaners are satisfactory for removing light-weight dust particles from surfaces, they do not satisfactorily remove heavier particles of, for example, cement and powder paint.

According to the present invention, there is provided a vacuum cleaner for removing particles from a surface comprising:-

a container for collecting at least some of the particles,

a frusto-conic chamber adapted to be located relative to the container so that the chamber tapers towards a base of the container, the chamber <sup>being</sup> /open at a lower end portion thereof nearest the base of the container and at an upper end portion thereof and the chamber having an inlet adjacent said upper end portion thereof so that air enters the chamber through the inlet in a tangential direction of the chamber, and

- 3 -

air transport means for drawing air from the chamber in a direction longitudinally of the chamber away from the base of the container,

so that the air is first drawn into the chamber through the inlet and flows in a cyclonic path causing heavier particles to be separated from lighter particles in the air.

The heavier particles are propelled by centrifugal force against the inner surface of the frusto-conic chamber and slide downwardly of the inner surface due to gravity falling away from the chamber to be collected in the container. The lighter particles are carried upwardly of the chamber and collect on a filter surface located adjacent an upper portion of the chamber.

The chamber may be provided with support means whereby the chamber is adapted to be removably located in the container. In this manner, the chamber is adapted for use with a vacuum cleaner which is operable without the chamber when it is required to remove only light-weight dust particles from surfaces.

The support means may comprise a circumferential flange adapted to receive a rim of the container.

The air transport means may be adapted to be located relative to the container in absence of the chamber.

5           The air transport means may comprise a circumferential flange adapted to receive a rim of the container.

The chamber may be provided with a housing for the air transport means.

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The housing may be provided with a filter for collecting at least some of said particles.

Following is a description, by way of example  
15 only and with reference to the accompanying drawing, which is a diagrammatic representation, of one method of carrying the invention into effect.

Referring to the drawing, there is shown a cylindrical container 10 having a circumferential wall  
20 11 and a base 12. The wall 11 of the container has an upper circumferential rim 13. The wall 11 of the container is provided with an aperture (not shown) adjacent the base 12, the aperture being closed by a removable plug 14. The container 10 is provided with  
25 wheels 15 so that the container is transportable.

- 5 -

The rim 13 has located thereon a chamber 16 comprising an upper cylindrical portion 17 and a lower frusto-conic portion 18 depending therefrom and tapering in a downward direction thereof. The cylindrical portion 17 is provided with a circumferential external skirt 19 adjacent the frusto-conic portion 18 whereby the chamber 16 is adapted to be located on the container 10 with the rim 13 located within the circumferential skirt 19. The chamber 16 is provided with an inlet 20 such that the longitudinal axis of the inlet 20 is disposed tangentially relative to an outer surface of the cylindrical portion 17, the inlet 20 being located adjacent the skirt 19. The chamber 16 is provided with an inner annular cavity 21 open from below as shown at 22. The annular cavity 21 is located axially of the chamber 16 adjacent the axial location of the inlet 20. The chamber 16 has located therein a filter 23 in the form of a paper bag such that the filter 23 extends inwardly of the cylindrical portion 17 of the chamber 16.

The chamber 16 is provided with an upper rim (not shown) on which is seated a power unit 24 including fan (not shown) and a filter support frame 25. The power unit 24 comprises a cylindrical housing 26 having an upper surface 27 and a lower circumferential skirt 28.

- 6 -

The upper surface 27 has secured thereto a handle 29 containing an electrical switch 30 and adapted to receive an end portion of a power cable 31 for supplying electric power to a motor (not shown) for operating the fan. The skirt 28 is adapted to receive the upper rim of the chamber 16. The filter support frame 25 is adapted to receive a cloth filter 32.

In use, the chamber 16 is located on the container 10 and the filter 23 is mounted on the chamber 16 so as to depend therein. The filter 32 is mounted on the support/<sup>frame</sup>23 and the power unit 24 is located on the chamber 16. An end portion of a hose (not shown) is connected to the inlet 20.

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In operation, the motor of the power unit 24 is operated causing air to be drawn through the hose (not shown) and into the chamber 16. An end portion of the hose remote from the inlet 20 is located adjacent a surface which is to have dust particles removed therefrom, the dust particles being carried by the air stream longitudinally of the hose and into the chamber 16.

Since the longitudinal axis of the inlet 20 extends tangentially to the outer surface of

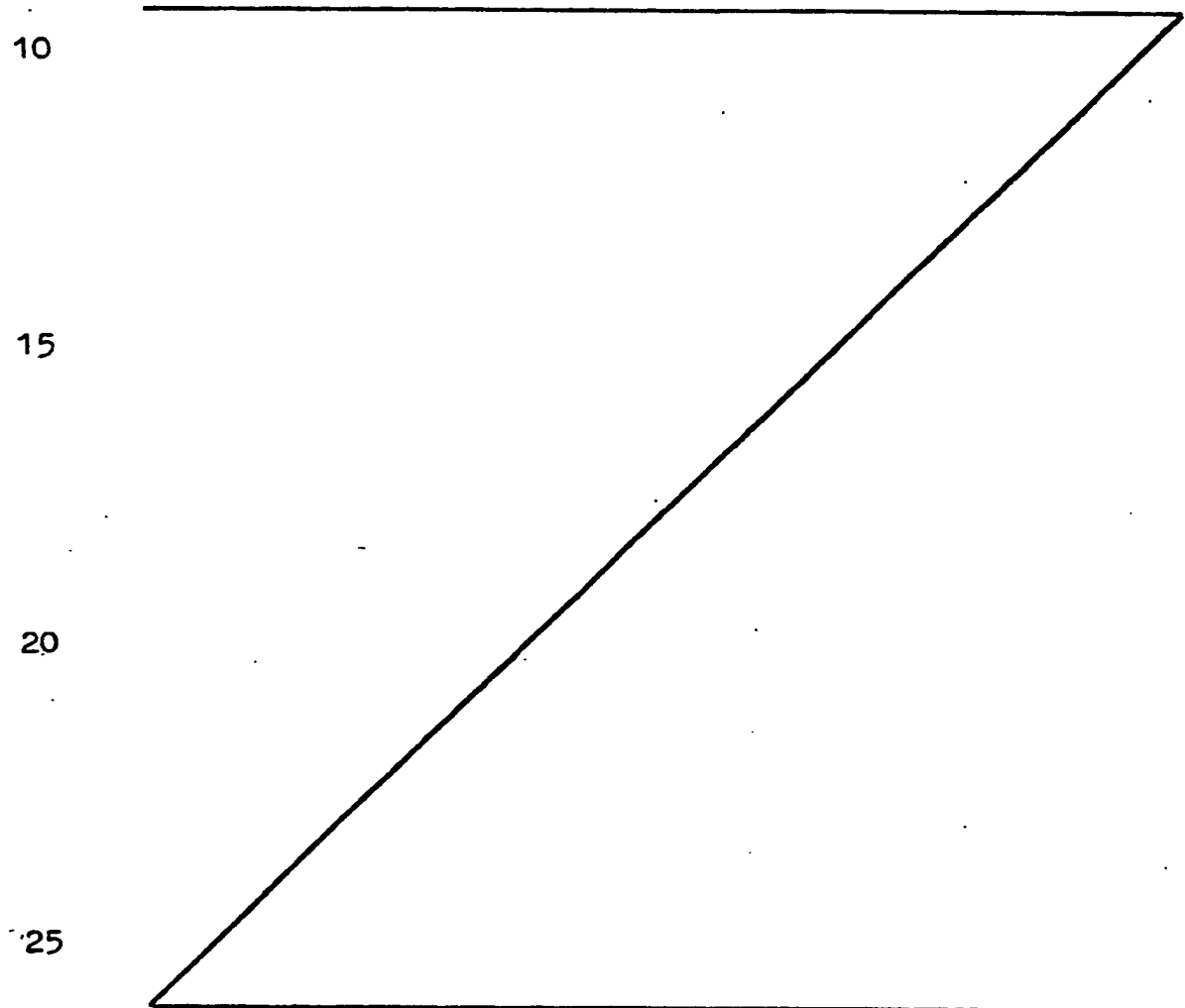
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the chamber 16, the air containing the dust particles is rotated in the inner angular cavity 21 relative to a longitudinal axis of the cylindrical portion 17 and, on moving outwardly through the opening 22 is constrained to move in a vortex due to the inner surface of the frusto-conic portion 18. The centrifugal force created by movement of the air moving in the vortex causes heavier dust particles to be propelled against the inner surface of the frusto-conic portion 18 while the lighter dust particles are carried upwardly longitudinally of the cylindrical portion 17 where they are collected on the surface of the filter 23 facing the inner circumferential surface of the cylindrical portion 17. Some of the lighter particles may pass through the filter 23 and are collected on the filter 32.

It will be appreciated that the heavier particles slide downwardly of the inner surface of the frusto-conic portion 18, due to gravity, and fall away from the chamber 16 to be collected in the container 10, the particles of intermediate weight being collected on the filter 23 and the lighter particles being collected on the filter 32.

- 8 -

It will further be appreciated that the container 10 and the power unit 24, which in combination may comprise a known vacuum cleaner and which may be operated by removing the plug 14 and inserting an end portion of the hose (not shown) in the aperture formerly blocked by the plug 14, may be arranged to have the chamber 16 located between the power head 24 and the container 10.





- 9 -

CLAIMS

1. A vacuum cleaner for removing particles from a surface comprising:-

a container for collecting at least some of the particles,

5 a frusto-conic chamber adapted to be located relative to the container so that the chamber tapers towards a base of the container, the chamber being open at a lower end portion thereof nearest the base of the container and at an upper end portion thereof and the chamber having  
10 an inlet adjacent said upper end portion thereof so that air enters the chamber through the inlet in a tangential direction of the chamber, and

air transport means for drawing air from the container in a direction longitudinally of the chamber  
15 away from the base of the container,

so that the air is first drawn into the chamber through the inlet and flows in a cyclonic path causing heavier particles to be separated from lighter particles in the air.

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2. A vacuum cleaner as claimed in claim 1 wherein the chamber is provided with support means whereby the chamber is adapted to be removably located in the container.

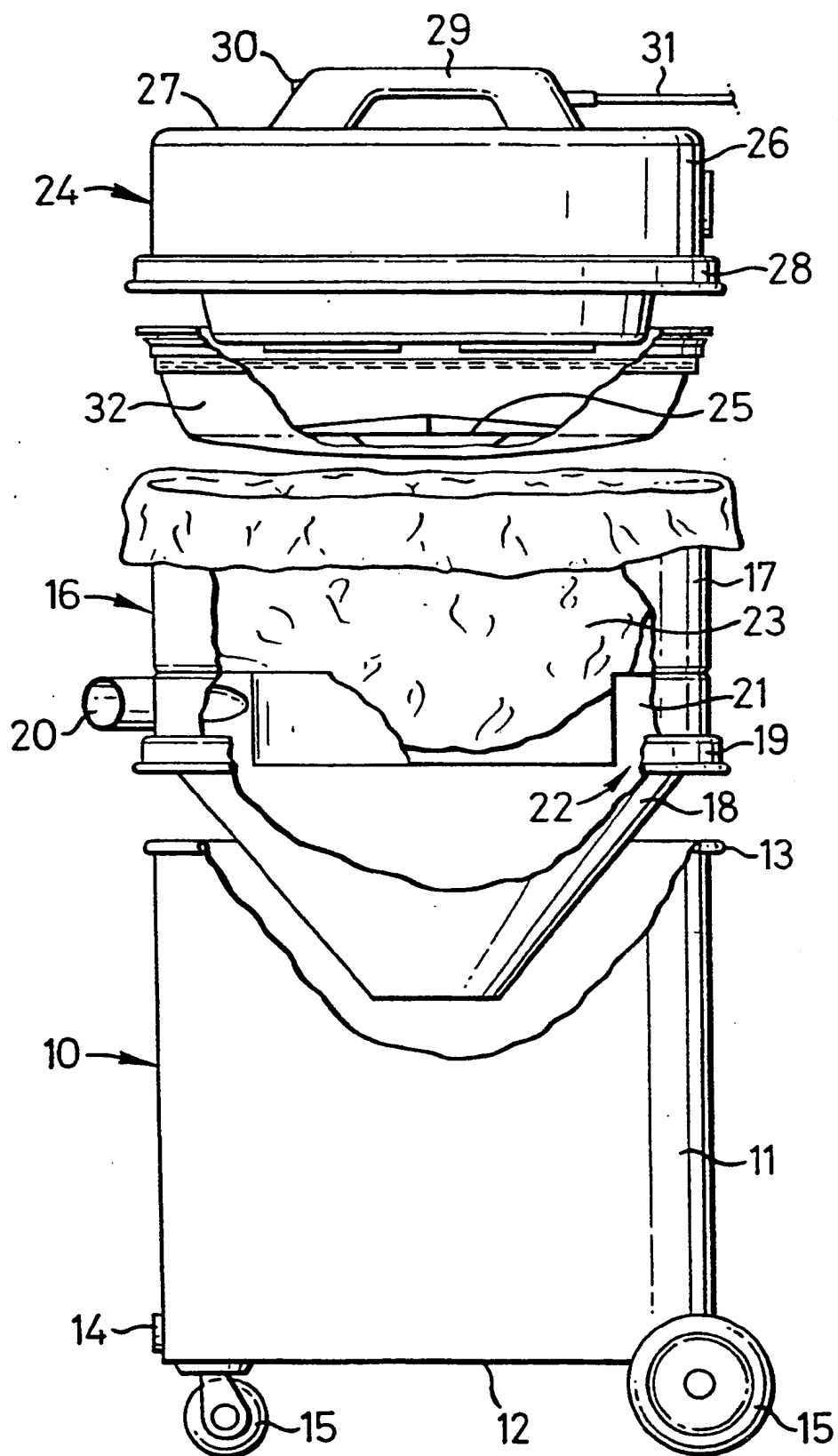
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- 10 -

3. A vacuum cleaner as claimed in claim 2 wherein the support means comprises <sup>circumferential</sup> / flange adapted to receive a rim of the container.
- 5 4. A vacuum cleaner as claimed in any one of the preceding claims wherein the air transport means <sup>is</sup> adapted to be located relative to the container in absence of the chamber.
- 10 5. A vacuum cleaner as claimed in any one of the preceding claims wherein the air transport means comprises a circumferential flange adapted to receive a rim of the container.
- 15 6. A vacuum cleaner as claimed in any one of the preceding claims wherein the chamber is provided with a housing for the air transport means.
- 20 7. A vacuum cleaner as claimed in any one of the preceding claims wherein the housing is provided with a filter for collecting at least some of said particles.
8. A vacuum cleaner chamber for a vacuum cleaner in accordance with any one of the preceding claims.

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European Patent  
Office

# EUROPEAN SEARCH REPORT

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EP 81 30 0380.3

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 2 171 248</u> (VAN BERKEL) * complete document *	1-3, 7,8	A 47 L 9/16
X	<u>DE - U - 7 401 147</u> (RINGLER)	1	
X	<u>DE - U - 1 927 723</u> (SIEMENS ELECTRO-GERÄTE AG)	1,2, 3,8	
A	<u>DE - A1 - 2 751 735</u> (PHILIPS' GLOEI-LAMPENFABRIEKEN)		TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	<u>DE - C - 742 954</u> (SIEMENS-SCHUCKERT-WERKE)		A 47 L 9/16
A	<u>DE - U - 6 604 811</u> (SIEMENS ELECTRO-GERÄTE)		
A	<u>DE - U - 1 983 651</u> (SIEMENS ELECTRO-GERÄTE)		
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search Berlin		Date of completion of the search 10-04-1981	Examiner KLITSCH

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